Review Report on PhD Thesis

Faculty: **Central European Institute of Technology**
Brno University of Technology in Brno

Academic year: **2019/2020**

Student: **Ing. Lukáš Flajšman**

Doctoral study program: **Advanced Materials and Nanosciences**

Field of study: **Advanced nanotechnologies and microtechnologies**

Supervisor: **prof. RNDr. Jiří Spousta, Ph.D.**

Co-supervisor: **Ing. Michal Urbánek, Ph.D.**

Reviewer**:** **Dr. Dafiné Ravelosona**

PhD thesis title: **Magneto-optical study of the dynamic properties of magnetic nanostructures and nanostructured metamaterials**

Topicality of doctoral thesis:

The research focuses on the possibility to tailor magnetic materials through ion beam irradiation for magnonic applications. The field of magnonics has attracted a great interest recently allowing the possibility to develop new concepts of spintronic devices with higher data-transfer speeds and lower power consumption. This a very innovative topic both from a fundamental and applicative point of view.

Meeting the goals set:

The goal of this thesis was to pioneer the applicability of the promising $Fe_{78}Ni_{22}$ system to the topic of magnonics. Acquiring a very good expertise of the field, Lukáš Flajšman could performed a detailed investigation into the possibility of modifying the structural and corresponding magnetic properties of $Fe_{78}Ni_{22}$ materials using Focused Ion Beam technique. This systematic experimental approach coupled to micromagnetic modeling allowed him to study and understand the spin-wave propagation in sets of magnonic waveguides.

Problem solving and dissertation results:

One striking result of the thesis is the possibility to set the uniaxial magnetic anisotropy of the $Fe_{78}Ni_{22}$ system by changing the Focused Ion Beam scanning angle. Based on this feature, the most relevant result of the research work is the demonstration of spin- wave propagation with an ion beam induced

nonmagnetic/magnetic phase transition. This is the details and the clarity of the results based on experiments (Focused Ion Beam, Kerr microscopy, Brillouin Light Scaterring) and micromagnetic modeling that makes this thesis so compelling and the description of the research so complete.

Importance for practice or development of the discipline:

In my opinion there is a major finding in this thesis, the demonstration of spin- wave propagation with an ion beam induced nonmagnetic/magnetic phase transition, which will have lasting impact within the spintronics community and participate to the development of the magnonic discipline and other branches of the magnetism.

Formal adjustment of the thesis and language level:

The language level is very good and the thesis vey clear. No formal adjustment of the thesis is necessary.

Questions and comments:

None

Conclusion:

In summary, I am very pleased with the quality of the research presented in this thesis. Lukas Flajsman has done a very nice piece of research which he has presented very clearly and which will have lasting impact and usefulness within the wider international research community. The thesis is very well organized. The narrative sections of the thesis are very clear and the figures of high graphical quality. The introductory chapters are very complete and of high pedagogical quality. The bibliography covers all of the major pre-existing work in this field and is appropriate.

In my opinion, the reviewed thesis fulfill all requirements posed on theses aimed for obtaining PhD degree. This thesis is ready to be defended orally, in front of respective committee.

In Orsay, date April 30th, 2020

Dr. Dafiné Ravelosona